AUTOMATIC TEMPERATURE CONTROLS

GENERAL

A. THE SCOPE OF WORK SHALL CONSIST OF PROVIDING ALL LABOR, MATERIAL, EQUIPMENT AND APPURTENANCES NECESSARY TO DESIGN, FURNISH, INSTALL AND MAKE OPERABLE A PNEUMATIC AUTOMATIC TEMPERATURE CONTROL (ATC) SYSTEM FOR PHERIFERAL AND SUABSTATION ACS UNITS.

B. THE CONTROL SYSTEM SHALL BE COMPLETE, CONSISTING OF BUT NOT LIMITED TO ALL NECESSARY CONTROL DEVICES, THERMOSTATS, VALVES, MOTORS, RELAYS, SWITCHES, DAMPERS, PANELS, AIR PIPING, AND ELECTRIC CONTROL WIRING TO PROVIDE THE FUNCTIONS AS DESCRIBED HEREINAFTER. ALL PRODUCTS SHALL BE THE PRODUCT OF ONE MANUFACTURER.

C. DESIGN AND PERFORMANCE OF THE ATC SYSTEM SHALL COMPLY WITH THE APPLICABLE PROVISIONS OF NFPA, UL, NEMA AND NYC BUILDING CODE.

D. THE ATC SYSTEM SHALL BE PROVIDED BY ONE OF THE FOLLOWING MANUFACTURERS OR APPROVED EQUAL:

1. HONEYWELL
2. JOHNSON CONTROLS

INSTRUMENTATION AND CONTROL DEVICES

ROOM THERMOSTATS

A. ROOM THERMOSTATS SHALL BE FULLY PROPORTIONING WITH FEEDBACK, UNLESS OTHERWISE SPECIFIED, SHALL HAVE ADJUSTABLE SENSITIVITY OR THROTTLING RANGE AND A SCALE RANGE OF AT LEAST 30°F. THE CONTROL POINT SHALL BE ADJUSTABLE 10°F. ABOVE AND BELOW ITS INTENDED SETTING.

B. ROOM THERMOSTATS SHALL BE CAPABLE OF CONTROLLING WITH PLUS OR MINUS 1/2°F., AND SHALL BE RESPONSIVE (CHANGE CONTROL PRESSURE) TO A 1/4°F. CHANGE.

C. UNLESS OTHERWISE NOTED, ROOM THERMOSTATS SHALL BE THE INDICATING TYPE. THERMOSTATS SHALL BE ADJUSTABLE TYPE WITH GRADUATED DIAL. FINISH SHALL BE MANUFACTURERS STANDARD , EXCEPT WHERE OTHERWISE NOTED ON THE DRAWINGS. THERMOSTAT LOCATION SHALL BE SUBBMITTED FOR APPROVAL BEFORE INSTALLATION.

DUCT THERMOSTATS

A. DUCT THERMOSTATS SHALL BE FULLY PROPORTIONING WITH FEEDBACK, SHALL HAVE ADJUSTABLE THROTTLING RANGE OR SENSITIVITY AND A SCALE OF AT LEAST 50°F. THE CONTROL POINT SHALL BE ADJUSTABLE 15°F. ABOVE AND BELOW ITS INTENDED SETTING.

B. THE DUCT THERMOSTATS SHALL BE CAPABLE OF CONTROLLING WITHOUT HUNTING AND SHALL BE RESPONSIVE (CHANGE CONTROL PRESSURE) TO A CHANGE OF 1/4°F.

C. THE CONTROL ELEMENTS OF THE DUCT THERMOSTATS SHALL BE CENTRALLY MOUNTED INSIDE THE SUPPLY DUCT OR CASING TO MEASURE THE AIR TEMPERATURE AND THIS SENSING SHALL BE TRANSMITTED TO THE CONTROL MECHANISM LOCATED ON THE LOCAL CONTROL PANEL. SUBMASTER THERMOSTAT SHALL HAVE AN ADJUSTABLE RESET RANGE AT LEAST 60% GREATER THAN SETTING SPECIFIED. ELEMENTS SHALL BE AVERAGING TYPE.

INDICATING DUCT THERMOMETERS

A. THERMOMETERS SHALL BE FLUSH MOUNTED ON LOCAL PANELS, ADJACENT TO ALL PANEL MOUNTED THERMOSTATS. THESE THERMOMETERS SHALL BE OF THE DIAL TYPE, MINIMUM 3-1/2" DIAMETER. UNIFORM SCALE OF SUITABLE RANGE SHALL HAVE SAME TYPE SENSING ELEMENTS AS DUCT THERMOSTATS.

TEMPERATURE TRANSMITTERS

A. ALL TRANSMITTERS SHALL BE CAPABLE OF MEASURING THE SPACE OR DUCT TEMPERATURE AND TRANSMITTING A SIGNAL DIRECTLY PROPORTIONAL TO THE TEMPERATURE. THE RANGE OF THE TRANSMITTER SHALL BE 50° F., 100° F., OR 200°F., AS REQUIRED. PROVIDE PLUGGED TEES FOR AIR GAUGE CONNECTION, ON TRANSMISSION LINES FOR PURPOSES OF CALIBRATION.

B. EACH TRANSMISSION SYSTEM (TRANSMITTER AND RECEIVER) SHALL HAVE AN ACCURACY OF 1% OF SCALE RANGE. ALL TRANSMITTERS SHALL BE LOCATED AT THE POINT OF MEASUREMENT.

RECEIVER CONTROLLERS

A. ALL RECEIVER CONTROLLERS SHALL BE OF THE NON BLEED TYPE AND SHALL BE LOCATED ON THE LOCAL CONTROL PANELS AND SHALL BE FULLY PROPORTIONING WITH FEEDBACK CONTROL ACTION. EACH CONTROLLER SHALL HAVE ADJUSTABLE THROTTLING RANGE. WHERE REMOTE READJUSTMENT INSTRUMENTS ARE REQUIRED, AN ADJUSTABLE RATIO FEATURE SHALL BE PROVIDED WHICH SHALL ALSO HAVE AN ACCURACY OF 1% SCALE RANGE.

AUTOMATIC CONTROL VALVES

A. ALL AUTOMATIC CONTROL VALVES SHALL BE FULLY PROPORTIONING WITH MODULATING PLUG OR V-PORT INNER GUIDES, UNLESS SPECIFIED OTHERWISE. THE VALVE SHALL BE QUIET IN OPERATION AND FAIL SAFE IN EITHER NORMALLY OPEN OR NORMALLY CLOSED POSITION IN THE EVENT OF CONTROL AIR FAILURE. ALL VALVES SHALL BE CAPABLE OF OPERATING AT VARYING RATES OF SPEED TO CORRESPOND TO THE CONTROLLERS AND VARIABLE LOAD REQUIREMENTS. THE VALVE SHALL BE CAPABLE OF OPENING IN SEQUENCE WHEN REQUIRED BY THE SEQUENCE OF OPERATION. ALL CONTROL VALVES SHALL BE SIZED BY THE CONTROLS MANUFACTURER AND SHALL BE GUARANTEED TO MEET THE HEATING AND COOLING LOADS AS SPECIFIED. ALL CONTROL VALVES SHALL BE SUITABLE FOR THE PRESSURE CONDITIONS AND SHALL CLOSE AGAINST THE DIFFERENTIAL PRESSURES INVOLVED. ALL CONTROL VALVES SHALL HAVE THROTTLING GUIDES AND RENEWABLE SEATS AND SHALL BE OF THE MOLDED SYNTHETIC RUBBER DIAPHRAGM TYPE. BODY PRESSURE RATING AND CONNECTION TYPE (SCREWED OR FLANGED) SHALL CONFORN TO SYSTEM WORKING PRESSURE UNLESS NOTED OTHERWISE.

B. CHILLED WATER VALVE SHALL HAVE LINEAR FLOW CHARACTERISTICS. VALVE SHALL BE DOUBLE SEATED TYPE OF 300 PSI CLASS.

DAMPER OPERATORS

A. ALL DAMPER OPERATORS SHALL BE OF THE MOLDED SYNTHETIC RUBBER DIAPHRAGM PISTON TYPE, SHALL BE FULLY PROPORTIONING, UNLESS OTHERWISE SPECIFIED. THEY SHALL BE QUIET IN OPERATION AND SHALL HAVE AMPLE POWER TO OVERCOME FRICTION OF DAMPER LINKAGE AND AIR PRESSURE ACTING ON LOUVERS TO POSITION DAMPERS ACCURATELY AND SMOOTHLY. THE DAMPER OPERATOR MOUNTING ARRANGEMENT SHALL BE OUTSIDE THE AIR STREAM WHEREVER POSSIBLE. THE OPERATORS SHALL BE CAPABLE OF OPERATING AT VARYING RATES OF SPEED TO CORRESPOND TO THE CONTROLLERS AND VARIABLE LOAD WHEN REQUIRED BY THE REQUIREMENTS. THE OPERATORS SHALL BE CAPABLE OF OPERATING IN SEQUENCE SEQUENCE OF OPERATION. THE OPERATORS SHALL HAVE EXTERNAL ADJUSTABLE STOPS TO LIMIT THE STROKE IN EITHER DIRECTION. THE OPERATOR LINKAGE ARRANGEMENT SHALL BE SUCH AS TO PERMIT NORMALLY CLOSED POSITIONS OF THE DAMPERS AS REQUIRED.

DAMPERS

A. ALL AUTOMATICALLY CONTROLLED DAMPERS SHALL BE OF THE OPPOSED BLADE TYPE. THE DAMPERS SHALL HAVE BLADES OF 16 GAUGE GALVANIZED STEEL WITH A MAXIMUM WIDTH OF EIGHT (8) INCHES AND MAXIMUM LENGTH OF FOURTY-EIGHT (48) INCHES. THE BEARING SHALL BE NON FERROUS SLEEVE TYPE. THE FRAMES SHALL BE OF 2" X 2" CHANNEL IRON MINIMUM, WITH WELDED CORNERS AND STIFFENING MEMBERS TO FORM A RIGID ASSEMBLY. ALL DAMPERS SHALL HAVE BOTH BLADES AND FRAMES GALVANIZED. ALL DAMPERS SHALL HAVE SOLID STOPS WITH VINYL EDGING TO INTERLOCK IN ORDER TO PREVENT LEAKAGE WHEN DAMPERS ARE CLOSED. MAXIMUM LEAKAGE SHALL NOT EXCEED 1% OF FULL FLOW AT 4" STATIC PRESSURE DIFFERENCE. ALL AUTOMATIC DAMPERS SHALL BE SUPPLIED AND MANUFACTURED BY THE CONTROLS MANUFACTUER.

B. DAMPERS MAY BE SIZED BY CONTROLS MANUFACTURETR, HOWEVER, THE FRAME SIZE OF THE DAMPER SHALL BE FULL DUCT SIZE. NO DAMPER SHALL BE SIZED FOR HIGHER THAN 1200 FPM FACE VELOCITY UNLESS INDICATED OTHERWISE.

POSITIONING RELAYS

A. FURNISH AND INSTALL POSITIVE POSITIONING RELAYS ON NON-STANDARD SPRINGS WITH ADJUSTABLE SPRING RATES TO INSURE PROPER SEQUENCE ADJUSTMENT FOR AUTOMATIC VALVES AND AUTOMATIC DAMPER MOTORS OPERATING IN SEQUENCE.

LOCAL CONTROL PANELS

A. FURNISH AND INSTALL ADJACENT TO THE AIR CONDITIONING UNIT(S), AS REQUIRED A LOCAL CONTROL PANEL. THE PANEL SHALL BE OF THE CABINET TYPE OF STEEL CONSTRUCTION WITH KEY TYPE LOCK, WITH PROPER BRACING FOR ALL WALL OR FLOOR MOUNTING. MOUNT ON THIS PANEL ALL ASSOCIATED TEMPERATURE CONTROLS SUCH AS RELAYS, SWITCHES, AIR GAUGES, THERMOSTATS AND THERMOMETERS WITH POINTS OF MEASUREMENTS WITHIN THE MECHANICAL EQUIPMENT ROOM.

B. THE CONTRACTOR SHALL PROVIDE, IN THE LOCAL CONTROL PANELS FOR THE PERIHERAL AIR CONDITIONING UNITS, MANUAL SWITCHES TO DUPLICATE THE MANUAL SWITCHING FUNCTIONS AT THE REMOTE FUNCTION PANEL, SUCH AS SUMMER-WINTER SWITCH, WARM-UP/COOL-DOWN SWITCH, DAY-NIGHT SWITCH, ETC.

C. A FLOW DIAGRAM OF THE SYSTEM SHALL BE FURNISHED AND MOUNTED ON EACH PANEL.

D. EACH CONTROL DEVICE ON THE PANEL SHALL BE MARKED WITH NAMEPLATES DESCRIBING ITS FUNCTION WITH CROSS-REFERENCING IT TO FLOW DIAGRAM.

E. SUBMIT SHOP DRAWINGS OF EACH PANEL FOR APPROVAL BEFORE FABRICATION.

CONTROL POINTS

A. ALL TEMPERATURES OF THERMOSTATS ETC., ARE INDICATIVE ONLY, AND THE DEVICE SHALL BE ADJUSTABLE ABOVE OR BELOW SUCH TEMPERATURES. IF CONTROL POINT IS NOT STATED, CONTROL RANGE OF DEVICE SHALL BE SUITABLE FOR THE INTENDED SERVICE.

B. WHERE CONTROL POINTS AND TEMPERATURE INDICATION POINTS ARE GROUPED FOR A NUMBER OF THERMOSTATS, EACH TYPE OF SPACE OR DUCT SENSOR SHALL HAVE ITS CONTROL ADJUSTOR AND INDICATOR AT THE LOCAL CONTROL PANEL, LOCATION AS DESIGNATED. IT SHALL BE POSSIBLE TO READ AND RESET TEMPERATURE OF THE REMOTE SPACES FROM THE CONTROL PANEL LOCATION.

C. PROVIDE ADJUSTABLE RANGE RESET DIAL (WITH PROTECTIVE COVER) FOR EACH DUCT THERMOSTAT.

PROTECTIVE THERMOSTATS

A. THE LOW LIMIT THERMOSTATS,(FREEZESTAT) SHALL BE LOCATED ON THE LOCAL CONTROL PANEL.

THERMOMETER GAUGES

A. THERMOMETER GAUGES SHALL BE INSTALLED FLUSH MOUNTED ON THE FRONT OF EACH LOCAL CONTROL PANEL AND ON THE SIDES OF THE ACS UNITS TO INDICATE TEMPERATURE OF EACH SYSTEM AS FOLLOWS AND AS APPLICABLE.

1. RETURN AIR TEMPERATURE
2. MIXING AIR TEMPERATURE
3. COOLING COIL DISCHARGE
4. SUPPLY AIR TEMPERATURE

AIR PIPING

A. THE CONTROL AIR PIPING SHALL BE OF SEAMLESS COPPER TUBING WITH SOLDER FITTINGS WHERE CONCEALED IN CONSTRUCTION AND SOLDERED, FLARED OR COMPRESSION TYPE FITTINGS WHERE EXPOSED. THE CONTROL PIPING SHALL BE HARD TEMPER COPPER TUBING. PIPING SHALL BE RUN HORIZONTALLY AND VERTICALLY PLUMB WITH REASONABLE PITCH TO DRIP POCKETS. ALL LOW POINTS IN MAINS AND RISERS SHALL BE INSTALLED WITH VALVED DRIP POCKETS. ALL PIPING AND AIR LINES SHALL BE PROPERLY SUPPORTED USING STRAPS, CLEATS OR HANGERS AS APPROVED. USE OF WIRE OR TAPE TO SUPPORT PIPING OR TUBING SHALL NOT BE PERMITTED. LOW PRESSURE AIR PIPING SHALL NOT BE TESTED UNDER A PRESSURE OF THIRTY (30) POUNDS FOR A PERIOD OF TWENTY-FOUR (24) HOURS, DURING WHICH TIME THE AIR PRESSURE DROP SHALL NOT EXCEED TEN (10) POUNDS.

B. PLASTIC TUBING SHALL BE PERMITTED FOR LOW PRESSURE PIPING, IN LIEU OF COPPER TUBING, WITHIN CONTROL CABINETS AND PANELS.

C. SHEATHING AND PLASTIC TUBING SHALL BE SAMUAL MOORE DEKORO POLYCOR OR AS APPROVED AND SHALL HAVE INTEGRAL ANTIOXIDENT, VERMINPROOF INHIBITOR.

D. AIR PIPING TO BE INSTALLED SHALL BE CONNECTED TO EXISTING AIR PIPING LOCATED AT EACH MECHANICAL EQUIPMENT ROOM AS INDICATED ON CONTRACT DRAWINGS.

GAUGES

A. AIR PRESSURE INDICATING GAUGES OF AT LEAST 1-1/2" IN DIAMETER SHALL BE FURNISHED AND INSTALLED TO INDICATE THE VARIABLE CONTROL AIR PRESSURE FOR EACH CONTROL DEVICE, SUCH AS DUCT THERMOSTATS, RELAYS, PILOT POSITIONERS, SWITCHES AND P-E AND E-P RELAYS, AND IN ADDITION, WHERE SHOWN ON CONTRACT DRAWINGS. PLUGGED TEE AIR GAUGE CONNECTION SHALL BE FURNISHED AND INSTALLED AT EACH CONTROLLED DEVICE SUCH AS VALVES AND DAMPER MOTORS. A MAIN AIR PRESSURE GAUGE SHALL BE FURNISHED AND INSTALLED AT EACH SYSTEM PANEL.

SAFETY SHUTOFF VALVE

A. UNDER NORMAL CONDITIONS THE SAFETY VALVE WILL BE WIDE OPEN TO ALLOW FLOW INTO THE COOLING COILS. WHEN THE PRESSURE IN THE OUTLET SIDE OF THE SAFETY SHUTOFF VALVE DROPS 10 PSIG BELOW THE SETPOINT OF THE PILOT CONTROL, THE VALVE SHALL CLOSE DRIP TIGHT. ONCE THE VALVE HAS CLOSED, THE VALVE MUST BE MANUALLY RESET TO OPEN, AFTER THE LOCAL SYSTEM HAS BEEN INSPECTED BY BUILDING PERSONNEL. THE VALVE SHALL INCLUDE A COVER MOUNTED LIMIT SWITCH WITH A SET OF DRY CONTACTS WHICH WILL CLOSE WHEN THE VALVE STARTS TO MOVE TO THE CLOSE POSITION. CLOSURE OF THE VALVE SHALL SOUND REMOTE ALARM IN A LOCATION AS DIRECTED BY THE ENGINEER, AND SHALL BE INDICATED AT THE LOCAL CONTROL PANEL.

B. THE VALVE BODY, COVER AND TRIM SHALL BE CAST BRONZE ASTM B-61, THE VALVE SHALL BE 300 PSI SCREWED ENDS. THE MAIN VALVE SHALL BE HYDRAULICALLY OPERATED, DIAPHRAGM ACTUATED, AND SHALL CONTAIN A RESILIENT, SYNTHETIC RUBBER DISC, HAVING A RECTANGULAR CROSS-SECTION, CONTAINED ON THREE AND ONE HALF-SIDES BY A DISC RETAINER AND FORMING A TIGHT SEAL AGAINST A SINGLE REMOVABLE BRONZE SEAT INSERT. THE DIAPHRAGM ASSEMBLY CONTAINING A VALVE STEM SHALL BE FULLY GUIDED AT BOTH ENDS BY A BEARING IN THE COVER AND AN INTEGRAL BEARING IN THE VALVE SEAT. DIAPHRAGM ASSEMBLY SHALL BE THE ONLY MOVING PART AND SHALL FORM A SEALED CHAMBER IN THE UPPER PORTION OF THE VALVE, SEPARATING OPERATING PRESSURE FROM LINE PRESSURE. THE DIAPHRAGM SHALL CONSIST OF NYLON FABRIC BONDED WITH SYNTHETIC RUBBER. ALL NECESSARY REPAIRS SHALL BE POSSIBLE WITHOUT REMOVING THE MAIN VALVE BODY FROM THE LINE.

C. THE PILOT CONTROL SHALL BE A DIRECT-ACTING, ADJUSTABLE, SPRING LOADED, DIAPHRAGM VALVE, DESIGNED TO PERMIT FLOW THROUGH THE MAIN VALVE WHEN CONTROLLING PRESSURE IS LESS THAN THE SPRING SETTING. THE VALVE SHALL BE RATED FOR 275 PSIG WORKING PRESSURE.

D. THE VALVE SHALL BE MODEL NO. 50-MOD SAFETY SHUTOFF VALVE AS MANUFACTURED BY CLA-VAL CO. (HARPER INTERNATIONAL, INC.).

ELECTRICAL MATERIALS

A. ALL AUTOMATIC TEMPERATURE CONTROL WIRING SHALL BE RUN IN CONDUIT

B. WIRES AND CABLES SHALL BE AS FOLLOWS:

1. SINGLE CONDUCTOR (120 VAC): TYPE THWN #14 AWG STRANDED, COLOR CODED RED FOR HOT LEG, WHITE FOR NEUTRAL, BLACK FOR ALL OTHERS, FOR USE IN CONDUIT, EMT OR IMC ONLY. LARGER GAUGE CABLES SHALL BE PROVIDED WHERE NECESSARY TO LIMIT THE VOLTAGE DROP TO 6 VOLTS.
2. ALARM, DIGITAL INPUT/OUTPUT AND CONTROL CABLES (24 VAC) TYPE PLTC 2/C #16 AWG PAIGE #P5489X SERIES AND MULTIPAIR #20 AWG PAIGE #P5491X SERIES OR APPROVED EQUAL.

SUBMITTALS

A. SUBMIT THE FOLLOWING:

1. CONTROL SYSTEM SCHEMATIC
2. FLOOR PLANS INDICATING LOCATIONS OF SENSORS, ACTUATORS, PANELS, ETC.
3. CATALOG CUTS FOR ALL AUTOCLATED CONTROL SYSTEM COMPONENTS.
4. DETAILED SYSTEM SEQUENCES OF OPERATION.
5. SCHEMATIC WIRING DIAGRAMS.
6. REPLACEMENT AND RECOMMENDED SPARE PARTS LISTS INCLUDING ORIGINAL EQUIPMENT MANUFACTURER PART NUMBERS.

B. SUBMIT WRITTEN CERTIFICATION THAT THE ATCS HAS BEEN INSTALLED AND TESTED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

TESTING, CALIBRATION AND COMMISSIONING

A. AFTER COMPLETION OF THE INSTALLATION, PERFORM FINAL CALIBRATIONS AND ADJUSTMENTS TO ALL ATC EQUIPMENT, AND SUPPLY ALL SERVICES INCIDENTAL TO THE PROPER PERFORMANCE TESTING OF THE ATC.

B. TEST AND ADJUST ATC SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

C. NOTIFY THE ENGINEER OF ANY TESTING 48 HOURS IN ADVANCE.

D. THE SEQUENCE OF OPERATION DESCRIBED IN THE CONTRACT DRAWINGS SHALL BE DEMONSTRATED FOR EACH SYSTEM.

OPERATION DEMONSTRATION

A. UPON COMPLETION OF THE CONTROL WORK AND IN THE PRESENCE OF THE ENGINEER, CONDUCT AN INSPECTION OF THE CONTROL SYSTEM AND PERFORM SUCH TESTS AS WILL BE REQUIRED TO DETERMINE THAT THE INSTALLATION IS AS SPECIFIED. ENGINEER SHALL BE NOTIFIED FIVE WORKING DAYS IN ADVANCE OF READINESS TO MAKE SUCH TESTS.

PERSONNEL TRAINING

A. PROVIDE A ONE-DAY TRAINING COURSE FOR TEN (10) MAINTENANCE PERSONNEL ON THE ATC SYSTEM INCLUDING ALL REQURE TRAINING MATERIAL

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF ONE OF THE CONTRACT DRAWINGS CONSTITUTING A PART OF CONTRACT NO. WTC-802.071 IN THE FORM IN WHICH SAID DRAWINGS EXISTED AT THE TIME THE SAID CONTRACT WAS EXECUTED BY THE PARTIES.

DATE 6/21/95 Sultan A. Askari
DATE 8/15/95 STAFF WRITER Peter K. Sweeney
ENGINEER OF DESIGN

FILE NAME CONTROLS.DWG SCALE FACTOR 1=0

Sheet 59 of 224

THE PORT AUTHORITY OF NY & NJ

Peter K Sweeney
ENGINEERING PROGRAM MANAGER - ALLIED TRADE

Mfred Hocwa
CHIEF MECHANICAL ENGINEER

No.	Date	Revison	Approved

Engineering Department
Design Division

The World Trade Center

Electrical/HVAC Upgrade Program

Title

TOWER ONE AND TWO LOW VOLTAGE SUBSTATIONS CONSTRUCTION AND INSTALLATION

MECHANICAL

NOTES

A.B.	E.E.	S.W.
Designed by	Drawn by	Checked by

Date 5/1/95 Scale AS NOTED

Contract Number WTC-802.071

Drawing Number M-6